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U.S. Department  
of Transportation

East Building, PHH – 30  
1200 New Jersey Avenue, Southeast  
Washington, D.C. 20590

**Pipeline and Hazardous  
Materials Safety Administration**

DOT-SP 15334

EXPIRATION DATE: September 30, 2014

(FOR RENEWAL, SEE 49 CFR § 107.109)

1. GRANTEE: Floating Pipeline Company Incorporated  
Halifax, Nova Scotia, Canada  
(US Agent: Becht Engineering Co., Inc.  
Liberty Corner NJ)
2. PURPOSE AND LIMITATIONS:
  - a. This special permit authorizes the manufacture, marking, sale and use of non-DOT specification hoop-wrapped fiber reinforced welded steel lined cylinders/tubes with water capacities of up to 2473 gallons (9360L) permanently fitted within an ISO frame, for the transportation in commerce of the materials authorized by this special permit. The non-DOT specification cylinders meet the ISO 11119-1 standard except as described herein. This special permit provides no relief from the Hazardous Materials Regulations (HMR) other than as specifically stated herein. The most recent revision supersedes all previous revisions.
  - b. The safety analyses performed in development of this special permit only considered the hazards and risks associated with transportation in commerce. The safety analyses did not consider the hazards and risks associated with consumer use, use as a component of a transport vehicle or other device, or other uses not associated with transportation in commerce.
3. REGULATORY SYSTEM AFFECTED: 49 CFR Parts 106, 107 and 171-180.
4. REGULATIONS FROM WHICH EXEMPTED: 49 CFR §§ 173.302a and 173.304a in that non-DOT Specification and non-UN Standard cylinders are not authorized, except as provided herein.

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5. BASIS: This special permit is based on the application of Floating Pipeline Company Incorporated dated April 3, 2011, and additional information dated August 23 and November 16, 2011, March 2, March 7, May 2, and June 28, 2012 submitted in accordance with § 107.105 and the public proceeding thereon.
6. HAZARDOUS MATERIALS (49 CFR § 172.101):

Hazardous Material Description			
Proper Shipping Name	Hazard Class/ Division	Identification Number	Packing Group
Methane, compressed or Natural gas, compressed (with high methane content)	2.1	UN1971	N/A

7. SAFETY CONTROL MEASURES:

a. PACKAGING - Packaging prescribed is a non-DOT specification Hoop wrapped fiber reinforced composite gas cylinder with a welded metallic load sharing liner. The cylinders are as described by the FPC User Design Specification; FPC dwg C340-000-00-01, Rev. A-01; Engineering specifications FPCCNGSPEC-01 & 02; Laminate procedure FPC-LPS 2010; Operations and Maintenance Manual Rev. D.3 and the additional information in the Floating Pipeline Company (FPC) application on file with the Approvals and Permits Division. Each cylinder must meet all the design, construction and testing requirements for UN composite cylinders specified in §178.71(l) and of ISO Standard 11119-1, Gas Cylinders of Composite Construction-Specification and Test Methods - Part 1: Hoop wrapped composite gas cylinders, First Edition 2005 except as follows:

(1) ISO Scope § 1 - Cylinders made under this special permit are limited to a minimum water volume of 450 liters and a maximum water volume of 9360 liters, and a service pressure up to 199 bar (2880 psi).

(2) Batch ISO § 3.3.1 & 3.3.2 - A batch is the quantity of liners or finished cylinders of the same nominal diameter, length, thickness and design, made successively from the same materials, and subjected to the same manufacturing process.

(3) Liner Materials ISO § 6.1.1 - The welded liner shell material shall conform to SA 841M, Grade F, Class 7 steel. The liner head material shall conform to SA 738M Grade E. Nozzles shall conform to SA 350 LF-2. Skirt material shall conform to API-5LX-60/65.

(4) Composite Materials § 6.2 - All materials shall meet the FPS Laminate Procedure Specification on file with the Approvals and Permits Division.

(5) Design and Manufacture (General) ISO § 7.1 - The cylinder shall meet the FPC User Design Specification on file with the Approvals and Permits Division.

(6) Design (General Requirement) ISO § 7.1.5 - The minimum fiber stress ratio for the glass fiber must be 2.50.

(7) Manufacturing ISO § 7.3.3 - Heating of the liner material shall not exceed 1200°F (650°C) except for welding. Barcol hardness testing of the cured composite shall indicate a minimum value of 41 HB when tested in accordance with ASTM D2583.

(8) Type approval procedure (General Requirement) ISO § 8.1

(i) A DOT Independent Inspection Agency (IIA) approved in writing by the Associate Administrator for Hazardous Materials Safety (AAHMS) in accordance with 49 CFR Subpart I must review the results of design qualification testing that was submitted in the application for special permit. The IIA must either verify that the cylinder design meets the requirements of the special permit based on the testing and other documentation submitted in the application for special permit, or the IIA may require additional testing and/or information from the manufacturer in order to verify the cylinder design meets all requirements of the special permit. Prior to

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production of cylinders, the IIA's verification of the cylinder design must be submitted to and acknowledged in writing by the Approvals and Permits Division.

(ii) Prior to any manufacture of cylinders under this special permit, an IIA approved in writing by the AAHMS must provide inspections and verifications of all batch testing and all new design qualification testing in accordance with the requirements of this special permit.

(9) Prototype tests ISO § 8.2.1, ISO § 8.2.2 - The cylinders required to be manufactured for prototype testing must be representative of production units. A sufficient number of cylinders shall be made available to complete the prototype testing or testing of the design variant. Subscale units are permitted as follows:

- (i) Ambient cycling - One test unit must be full scale, additional units must be full diameter, and may be shorter length, not less than 10 Ft;
- (ii) LBB - test unit must be full diameter and may be shorter length, not less than 10 Ft;
- (iii) Environmental fluid - test unit may be smaller diameter and shorter length, not less than 10 Ft;
- (iv) Environmental cycle - test unit may be smaller diameter and shorter length, not less than 10 Ft;
- (v) High temperature creep and accelerated stress rupture - test unit may be smaller diameter and shorter length, not less than 10 Ft;
- (vi) Flaw - test unit must be full diameter and may be shorter length, not less than 10 Ft;
- (vii) Gunfire - test unit must be full diameter and may be shorter length, not less than 10 Ft;

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(viii) Torque - test unit must be full diameter and may be shorter length, not less than 10 Ft;

(10) Inspector ISO § 8.2.7 - The IIA must witness all testing as specified in this special permit

(11) Drop test ISO § 8.2.7j, § 8.5.12 - Cylinders made under this special permit are not authorized for shipment unless mounted in an International Convention for Safe Containers (CSC) frame meeting the FPC User Design Specification requirements and must be handled in accordance with the operational controls listed in this special permit and FPC information on file, therefore they are exempt from drop test requirement of § 8.2.7j.

(12) Salt water immersion test ISO § 8.2.7g, § 8.5.9 - Cylinders made under this special permit are not authorized for underwater use therefore cylinders are exempt from the salt water immersion test.

(13) Torque test ISO § 8.2.7h, § 8.5.10 - Testing of the clamp fitting and valve assembly shall be to the manufacturer's recommendations.

(14) New design ISO § 8.3.2(d) - a minor change to a resin component that is within the same specification (i.e. from one epoxy to another) may be qualified as a design variant.

(15) Design Variant ISO § 8.4 - Attached Table 2 (qualification tests) must be followed in lieu of Table 2 of ISO 11119-1. Any change to Table 2 must be approved in writing by the AAHMS.

Table 2. Qualification tests for cylinders with maximum test pressure  $\leq 298$  bars, water volume greater than 450 liters and less than or equal to 9360 liters.

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Notes:

1. For a new design of a cylinder with water capacity larger than 450 L, a minimum of 1 cylinder may be used for each design change.
  - a. Where the design variant's burst pressure to test pressure ratio is over 20% greater than the same ratio for the approved design.
  - b. When length increases up to 50% and/or diameter increases up to 20%, fire test may not be required if the capacity stays the same or decreases and the same PRD system is used.
2. Test to be conducted for reduction in diameter only.
3. Test to be conducted for reduction in thickness only.

(16) Hydraulic proof pressure and Hydraulic volumetric expansion test ISO § 8.5.1 & § 8.5.2 - Additional criteria shall be that Compressed Gas Association Publication C-1 "Methods for Hydrostatic Testing of Compressed Gas Cylinders" are followed.

(17) Liner burst test ISO § 8.5.3.2 - Additional criteria shall be that failure not occur in any weld.

(18) Cylinder burst test ISO § 8.5.4.1 - One cylinder shall be full size with others no shorter than 10 feet in length.

(19) Cylinder burst test criteria ISO § 8.5.4.2 - Additional criteria shall be that failure must not occur in any weld.

(20) Ambient cycle test ISO § 8.5.5.1.1 & 8.5.5.1.2 - The cylinders must be cycled to 125% of the working pressure or higher. At least one cylinder must be a full scale cylinder. One of the cylinders may be subscale with full diameter, with shorter length not less than 20 feet. The cylinder must pass the LBB test.

(21) Ambient cycle test criteria ISO § 8.5.5.1.3 - The cylinder shall withstand a minimum number of 12,000 cycles without leakage. The cylinder shall continue cycling until it leaks. A failure during this second part of the test by burst, is a failed test.

(22) Environmental cycle test procedure ISO § 8.5.6.1 - The cylinder may be subscale with full diameter, with shorter length not less than 10 feet.

(23) High velocity impact (gunfire) test procedure ISO § 8.5.7.2 & 3 - The cylinder, which may be of shorter length not less than 10 feet shall be filled to service

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pressure with air, nitrogen, or the gas to be contained. The cylinder shall be impacted by a 0.50 caliber armor piercing projectile and a 0.50 caliber "tumbled armor piercing projectile from an approximate distance of 50 yards, at a point in the side wall at a nominal 90 degree angle. Cylinders shall not fragment.

(24) Fire resistance test ISO § 8.5.8.2 & 3 - The cylinder must be tested in a horizontal position under the following fire conditions:

(i) A single cylinder shall pass a "pan fire test". The cylinder must be placed in a pan at least 8" deep and extending beyond the cylinder on all sides 12 to 24 inches. The pan must contain 150 gallons minimum of diesel fuel or JP-4. The fuel or JP-4 shall be ignited and allowed to burn out. The pressure in the cylinder shall be monitored and shall at no time exceed the test pressure of the finished composite reinforced tube. Results are acceptable if the contents do not vent or vent through the PRD. The cylinder must not rupture. After successfully passing the fire test, the cylinder must successfully pass a burst test to 1.5 times service pressure. Any failure during the test of a valve, fitting or tubing shall invalidate the result. Direct flame impingement is not permitted on valves, fittings, and/or pressure relief devices. The fire and its position relative to the cylinder must be approved by the IIA Inspector.

(25) Salt water immersion test ISO § 8.5.9 - The salt water immersion test is not required, as the cylinder is not authorized for underwater applications. Alternatively, one cylinder must be tested to the Flaw/Environmental Fluid test (In Service Damage Cycle) as described in the FPC application on file with the Approvals and Permits Division. A subscale cylinder with full diameter and shorter length not less than 10 feet may be used. The cylinder must not leak or rupture within the first 3,000 cycles, but may fail by leakage during the remainder of the cycles. The test may be suspended if no failure has occurred after 5,000 cycles.



(26) Torque test procedure ISO § 8.5.10 - The procedure shall follow manufacturer's recommendations to ensure that fit and function of the clamp assembly and the threaded nozzle standard is not exceeded.

(27) High temperature creep test procedure ISO §§ 8.5.11.1, 8.5.11.2 - One cylinder, which may be of shorter length not less than 10 feet, shall be hydrostatically pressurized to test pressure at 60°C. The cylinder shall be held at this pressure and temperature for 1,000 hours. The cylinder shall then be pressurized to burst in accordance with the procedure described in ISO § 8.5.4.1, except that the burst pressure shall exceed 1.25 the service pressure.

(28) Drop test ISO §§ 8.5.12 - This test is not required. Alternatively a blunt impact test shall be successfully completed as follows:

(i) One cylinder which may be of shorter length not less than 10 feet shall be impacted twice. The cylinder shall be restrained from movement during the testing. One impact shall occur midway between ends at the side wall, and once near the domes at the termination of the overwrap. The impact shall occur by a weight or pendulum with a diameter approximately 10% of the cylinder nominal diameter capable of producing a striking force of at least 1,500 joules.

(ii) The cylinder shall then pass the ambient cycle test of 3,000 cycles to 1.25 times service pressure without leakage or burst. Test continuation for the lessor of 9,000 cycles or until leakage is considered satisfactory. A cylinder burst during the additional 9,000 cycles is a failure.

(iii) Parameters to monitor and record shall be those of the ambient cycle test as well as the visual appearance after each impact to include position and dimension of damage.

(29) Batch inspection and testing hardness ISO § 9.1.2 Supplier's certification of the liner properties may serve as verification of compliance.

(30) Liner Batch inspection and testing sampling ISO § 9.1.3 - Supplier's certification of the material properties may serve as verification of compliance.

(31) Overwrap materials ISO § 9.3 - Supplier's certification of the fiber properties may serve as verification of compliance.

(32) Overwrap materials ISO § 9.3.1 - Additional tests shall include:

(i) Resin Shear Strength - Resin materials must be tested in accordance with procedures described in the FPC application on file with the Approvals and Permits Division.

(ii) Hardness of cured composite - Each completed cylinder must be tested in accordance with procedures described in the FPC application on file with the Approvals and Permits Division.

(33) Overwrap materials ISO § 9.3.2 - Does not apply.

(34) Batch testing procedure ISO § 9.4.5 - One cylinder out of 5 batches or one year of cylinder production, whichever comes first. A batch here is defined to be production quantity of up to 200 finished cylinders successively produced (plus finished cylinders required for destructive testing), of the same nominal diameter, length, thickness and design. The batch of finished cylinders may contain different batches of liners, fibers and matrix materials.

(35) Batch testing criteria ISO § 9.4.6 - The burst test may be conducted on the first unit of the batch. After reaching the minimum required burst pressure, and holding for 5 seconds, the cylinder shall have passed the test. The pressure cycle tested cylinder under 9.4.5 may be used.

(36) Marking ISO §§ 10.1 & 10.2 - marking must contain the following:

(i) DOT special permit number followed by working pressure expressed in bar (psig) and "CNG" on the same line. A second line shall state,

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"Residual pressure minimum" 10 bar (150 psig). Marking may be on a label permanently attached to the outside of the cylinder;

- (ii) A serial number and the manufacturer's identification number or a symbol as obtained from the Associate Administrator for Hazardous Materials Safety, located just below or immediately following the DOT marking.
- (iii) The DOT Independent Inspector Agency (IIA) official mark must be placed near the serial number. The marking must contain the date (month and year) of the initial hydraulic proof pressure test for that cylinder.
- (iv) The size of the letters and numbers used must be at least 0.64 cm (1/4 inch) high if space permits.
- (v) The following are examples of an authorized format for marking:

DOT-SP AAAAA-YYYY

(where AAAAA is the special permit number and YYYY is the working pressure)

CCCC MMI

(where CCCC is the serial number and MMI is the manufacturer's mark or symbol)

DDD - MM/YY

(where DDD is the inspectors mark and MM/YY is the month and year of the hydraulic proof pressure test).

Additional markings are permitted, provided the additional markings do not obscure the required marking and are not detrimental to the integrity of the cylinder. The required requalification dates and RIN information markings must be placed near the cylinder markings.

b. Requalification -

- (1) Each cylinder must be requalified the sooner of once every three years or 1500 fills by a qualified person holding a valid DOT RIN in accordance with § 107.805 as follows:
  - (i) Each cylinder must pass an Internal visual inspection in accordance with CGA pamphlet C-6 and C-6.2/FPC Operations and Maintenance Manual, Revision D.3 on file with the Approvals and Permits Division and hydraulic proof pressure test in accordance with CGA C-1 equal to 1.5 times the marked working pressure and hold the pressure for a minimum of 3 minutes without a loss of pressure.
  - (ii) Each cylinder must pass an external visual inspection in accordance with FPC Operations and Maintenance Manual, Revision D.3
- (2) Persons who perform inspection and testing of cylinders subject to this special permit must comply with § 180.205(b) and with all the terms and conditions of this special permit and the HMR.
  - (i) Visual examination must be performed by inspectors who have documented testing that as a minimum demonstrates the following:
    - (A) An annual visual acuity test to ensure natural or corrected near distance vision;
    - (B) Capability of distinguishing and differentiating contrast between colors;
    - (C) Capability of reading a Jaeger Type No. 1 standard chart at not less than 12 inches.
- (3) Requalification date (month/year) must be permanently marked on the cylinder as specified in paragraph § 180.213. The marking of the RIN symbol on the cylinder certifies compliance with all of the terms and conditions of this special permit.

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c. OPERATIONAL CONTROLS -

- (1) Cylinders manufactured under this special permit are not authorized for use 15 years after the date of manufacture.
- (2) A cylinder that has been subjected to fire may not be returned to service.
- (3) Cylinders are permanently mounted inside of framing that is designed, marked (approval plate) and approved in accordance with the International Convention for Safe Containers (CSC) (49 CFR Part 451) as described in the FPC application on file with the Approvals and Permits Division. The frame design must conform to the following:
  - (i) All requirement of § 173.301(i);
  - (ii) All requirements of CGA TB-25;
  - (iii) Stacking of containers is prohibited;
  - (iv) Bottom lifting of containers is prohibited.
- (4) Re-rating or alterations to the cylinder or cylinder assembly is prohibited unless previously authorized in writing by the AAHMS.
- (5) Prior to use in Offshore Service under the terms of this special permit, additional information justifying such use must be submitted to and acknowledged in writing by the AAHMS.

8. SPECIAL PROVISIONS:

- a. In accordance with the provisions of Paragraph (b) of § 173.22a, persons may use the packaging authorized by this special permit for the transportation of the hazardous materials specified in paragraph 6, only in conformance with the terms of this special permit.
- b. A person who is not a holder of this special permit, but receives a package covered by this special permit, may reoffer it for transportation provided no modification or change is made to the package and it is offered for transportation in conformance with this special permit and the HMR.

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c. A current copy of this special permit must be maintained at each facility where the package is offered or reoffered for transportation.

d. Each packaging manufactured under the authority of this special permit must be either (1) marked with the name of the manufacturer and location (city and state) of the facility at which it is manufactured or (2) marked with a registration symbol designated by the Office of Hazardous Materials Special Permits and Approvals for a specific manufacturing facility.

e. A current copy of this special permit must be maintained at each facility where the packaging is manufactured under this special permit. It must be made available to a DOT representative upon request.

f. Persons who perform non-destructive, examination of cylinders subject to this special permit must comply with the criteria of ASME Section V for the applicable examination type and with all the terms and conditions of this special permit and the HMR.

i. Visual examination must be performed by inspectors who have documented testing that as a minimum demonstrates the following:

(A) An annual visual acuity test to ensure natural or corrected near distance vision;

(B) Capability of distinguishing and differentiating contrast between colors;

(C) Capability of reading a Jaeger Type No. 1 standard chart at not less than 12 inches.

9. MODES OF TRANSPORTATION AUTHORIZED: Motor Vehicle.

10. MODAL REQUIREMENTS: A current copy of this special permit must be carried aboard each motor vehicle used to transport packages covered by this special permit.

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11. COMPLIANCE: Failure by a person to comply with any of the following may result in suspension or revocation of this special permit and penalties prescribed by the Federal hazardous materials transportation law, 49 U.S.C. 5101 et seq:

- o All terms and conditions prescribed in this special permit and the Hazardous Materials Regulations, 49 CFR Parts 171-180.
- o Persons operating under the terms of this special permit must comply with the security plan requirement in Subpart I of Part 172 of the HMR, when applicable.
- o Registration required by § 107.601 et seq., when applicable.

Each "Hazmat employee", as defined in § 171.8, who performs a function subject to this special permit must receive training on the requirements and conditions of this special permit in addition to the training required by §§ 172.700 through 172.704.

No person may use or apply this special permit, including display of its number, when this special permit has expired or is otherwise no longer in effect.

Under Title VII of the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU)—"The Hazardous Materials Safety and Security Reauthorization Act of 2005" (Pub. L. 109-59), 119 Stat. 1144 (August 10, 2005), amended the Federal hazardous materials transportation law by changing the term "exemption" to "special permit" and authorizes a special permit to be granted up to two years for new special permits and up to four years for renewals.

12. REPORTING REQUIREMENTS: Shipments or operations conducted under this special permit are subject to the Hazardous Materials Incident Reporting requirements specified in 49 CFR §§ 171.15 Immediate notice of certain hazardous materials incidents, and 171.16 Detailed hazardous materials

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incident reports. In addition, the grantee(s) of this special permit must notify the Associate Administrator for Hazardous Materials Safety -- OHMSPA, in writing within 30 days, of any incident involving the package, shipment or operation conducted under terms of this special permit.

Issued in Washington, D.C.:

A handwritten signature in blue ink, appearing to read 'M. El-Sibaie', is written over a faint, circular official stamp.

Dr. Magdy El-Sibaie

Associate Administrator for Hazardous Materials Safety

Address all inquiries to: Associate Administrator for Hazardous Materials Safety, Pipeline and Hazardous Material Safety Administration, U.S. Department of Transportation, East Building PHH-30, 1200 New Jersey Avenue, Southeast, Washington, D.C. 20590.

Copies of this special permit may be obtained by accessing the Hazardous Materials Safety Homepage at [http://hazmat.dot.gov/sp\\_app/special\\_permits/spec\\_perm\\_index.htm](http://hazmat.dot.gov/sp_app/special_permits/spec_perm_index.htm) Photo reproductions and legible reductions of this special permit are permitted. Any alteration of this special permit is prohibited.

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